variegated, it is not Sa-mu-wa, it is not the wife of our Lord Tan-oo Shan. Look at her accurately. If she be white and dresses in white, she is the veritable Sa-mu-wa; and he is the true Tan-oo Shan."

Additions to the knowledge of Silk;—*by Captain* J. Mitchell, *Superintendent of the Government Museum, Madras.*

[Received 9th October, 1865.]

In the year 1859, I had occasion to examine with the microscope several kinds of raw silk, and I then discovered that the silk of *Antherea paphia*, commonly known as Tussah silk, had a very peculiar structure, differing entirely from that of the several species of *Bombyx*.

My duties, up to a very recent date, left me no time for original research and the Tussah silk was consequently put aside. It was not, however, forgotten, and I have taken advantage of the leisure afforded by a holiday to endeavour to elucidate the structure of the filament.

The silk of *Bombyx* is *cylindrical* or nearly so. It is translucent and, apparently, homogeneous. The larva spins a double filament; the two filaments, being laid side by side like two fine glass rods, are held together by a gummy cement which is soluble in water. The silk of *Antherea paphia* is *flat*, and appears to be composed of a number of opaque rods placed side by side, the intervals between the rods being filled in by a translucent cement, very difficult to dissolve.—The filament is evidently compound. Under certain conditions of illumination, it bears considerable resemblance to one of the coarser bands of Hobert's Test Plate.

This very peculiar appearance of the Tussah filament, is readily seen with a quarter or half inch Achromatic; but the demonstration of its compound structure, in that exact way that will alone satisfy the demands of science, is a more difficult matter, on account of the insolubility of the cement which binds the elementary, or primary filaments together. Macerating the silk in water for upwards of a month did not separate them, alcohol did not do so. Acetic acid mixed with alcohol appears to promise well; but the only way in

which I have yet been able to effect a separation is by tearing the silk gently with fine bent needles. In this way, small portions have been opened out, and the compound nature of the filament placed beyond a doubt. I have been able to measure the diameter of the filaments, not very accurately, however, on account of their transparency, but the finest do not exceed $\frac{1}{35000}$th of an inch.

It is scarcely prudent to speculate upon the kind of organ by which this silk is produced, there is, however, reason to believe, that the silk issues in the form of a hollow, or ribbed cylinder, of which the opaque ribs are the primary filaments, and the interspaces the cement. Such a cylinder, while in a soft state, would collapse, as soon as the central support was withdrawn, and its application to a leaf, or a part of the cocoon already spun, would cause it to be flat. This of course is only surmise, and is only given as a hint to any one who may have the means and inclination to pursue the enquiry. It can only be demonstrated by a careful preparation of the spinning organs of the caterpillar which, if I have guessed rightly, will be found in the form of a ring of minute apertures set round a central papilla.

The silk of the *Actias selene* is flat like Tussah silk, and from its fibrous appearance, there can be little doubt that it also is compound. That of *Attacus atlas* appears to be cylindrical, it is, however, finely grooved on the surface, and is in all probability a compound structure like the other two.

I have examined several kinds of silk, and have invariably found it to consist of two filaments, simple or compound, as the case may be, placed side by side. I mention this because in all the works save one, to which I have been able to refer the silkworm is said to spin a single thread. The exception is "Adam's Essays on the Microscope." Edition of 1798. It is there correctly stated that the filament is double.